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REMARKS

Claims 1, 4-8, 11-14, and 29-35 stand rejected on prior art grounds. Claims 1, 4-8, 11-14, 29, and 31-35 stand rejected upon informalities. Claims 36-37 have been added. Applicants respectfully traverse the rejections based on the following discussion.

I. The 35 U.S.C. 112, Second Paragraph, Rejection

Claims 1, 4-8, 11-14, 29, and 31-35 stand rejected under 35 U.S.C. 112, second paragraph. More specifically, the Office Action argues that the phrase "numerous thermal excursions" makes the claims indefinite as it is not clear how many thermal excursions are performed (Office Action, p. 2, para. 2). Applicants have amended independent claims 1, 8, and 29 to replace "numerous" with "more than one". Accordingly, the amended claims clearly define that "more than one" thermal excursion is performed.

In addition, the Office Action argues that it is not clear what temperature and duration is considered a thermal excursion (Office Action, p. 2, para. 2). Applicants respectfully submit that it is not necessary to claim the specific temperature or the specific duration of the thermal excursions. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

II. The Prior Art Rejections

Claims 1, 4-7, and 29-35 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Xu, et al. (U.S. Patent No. 6,680,436), hereinafter referred to as Xu, in view of Capote, et al. (U.S. Publication No. 2005-0218517), hereinafter referred to as Capote. Claims 8 and 11-14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Xu, in view of Capote, and in further view of Applicant's Admitted Prior Art, hereinafter referred to as AAPA. Applicants respectfully traverse these rejections based on the following discussion.

The claimed invention provides an integrated circuit structure comprising a compressible film surrounding sides of solder connectors, wherein the compressible film has sufficient compressibility to accommodate expansion of the solder connectors when

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melted. In the rejection, the Office Action argues that Xu and Capote disclose the claimed structure. However, the encapsulant 150 of Xu and the flux adhesive 34 of Capote (which are each proposed to be the compressible film in the Office Action) are not actually compressible. Instead, both the encapsulant 150 and the flux adhesive 34 are described as being substances that "harden" when heated. Therefore, as explained in greater detail below, Applicants respectfully submit that the prior art of record does not teach or suggest the claimed invention.

Applicants respectfully traverse these rejections because the proposed combination of Xu and Capote does not teach or suggest that the "compressible film remains compressible through more than one thermal excursion" (independent claims 1, 8, and 29). More specifically, the encapsulant 150 of Xu and the flux adhesive 34 of Capote (which are each proposed to be the compressible film in the Office Action) are not actually compressible. Instead, both the encapsulant 150 of Xu and the flux adhesive 34 of Capote are described as being substances that "harden" when heated (Xu, col. 4, lines 1-7; and, Capote, para. 0147). Applicants submit that nothing within Xu teaches or suggests that the encapsulant 150 is compressible when heated. Rather, column 4, lines 1-7 of Xu provides that "heating the assembly activates the curing agent within the encapsulant 150, causing encapsulant 150 to *harden* around the solder connections" (emphasis added).

In regards to Capote, even though the attachment and stress distribution layers 38 and 40 "are generally stiffer than layer 42" (Capote, para. 147), there is no indication that the reworkability layer 42 (which is also proposed to be the compressible film in the Office Action) is actually compressible. Simply because one layer may be stiffer than another layer does not necessarily indicate that one layer has a compressible nature. Instead of being designed to compress and absorb some of the expansion of the solder, it is clear that layer 42 in the structure described by Capote was intended to allow the piece to be "reworked" because Capote states that "rework is made possible by the layer 42" (Capote, para. 147). There is no indication within Capote that layer 42 was intended to be compressible or that it performs any compressible functions because layer 42 is intended to allow the piece to be reworked and is not intended to absorb any expansion of the solder as is defined by Applicants' independent claims. Therefore, since the

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reworkability layer 42 described in Capote is not indicated as having a compressible nature, it would not teach or suggest one ordinarily skilled in the art to utilize the claimed compressible film that "remains compressible through more than one thermal excursion" as defined by independent claims 1, 8, and 29.

Further, the flux adhesive 34 is not actually compressible and instead is described as being a layer that is "hardened" (paragraph 147) after the solder is reflowed. More specifically, Capote describes that the solder is reflowed and the flux adhesive 34 is hardened and that "the flux adhesive 34 firmly retains the layer 40 and part of the solder bumps 14 on the substrate 20 while the chip bonding layer 38 firmly retains the other part of the solder bumps 14 on the chip 10 as the reworkable layer 42 separates without damage to the chip 10 or the substrate 20" (Capote, para. 147). Therefore, it is Applicants' position that the flux adhesive 34 described in Capote does not have a compressible nature and instead is designed to be hardened. As such, the flux adhesive 34 would not provide capability of absorbing any expansion of the solder as the claimed invention does. Therefore, since the flux adhesive 34 described in Capote is described as a "hardened" layer, it would not teach or suggest one ordinarily skilled in the art to utilize the claimed compressible film that "remains compressible through more than one thermal excursion" as defined by independent claims 1, 8, and 29.

To the contrary, with the claimed invention the compressible film remains compressible through more than one thermal excursion. For example, as described in paragraph 29, the various embodiments herein use a compressible film around the device to carrier connection to provide a volume into which the solder can expand (before it reaches the underfill), thereby allowing the underfill to support the "bumps" even after more than one thermal excursion. The result is that solders can be used with all their advantages, without incurring the negative impact of solder volume expansion.

Therefore, it is Applicants' position that the proposed combination of Xu and Capote does not teach or suggest the claimed compressible film that "remains compressible through more than one thermal excursion" as defined by independent claims 1, 8, and 29 and therefore Capote does not anticipate independent claims 1, 8, or 29. Further, dependent claims 4-6, 11-14, and 31-37 are similarly not anticipated, not only because they depend from non-anticipated independent claims, but also because of

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the additional features of invention they define. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

In addition, Applicants submit that because neither Xu nor Capote teach or suggest a compressible film that remains compressible through more than one thermal excursion, then the proposed combination of Xu and Capote also fails to teach a compressible film that has sufficient compressibility to accommodate up to a 3% volume expansion of connectors when the connectors are melted without damaging an underfill. Such a feature is defined in independent claim 8 and dependent claims 36-37 using similar language.

As more fully described above, the encapsulant 150 of Xu and the flux adhesive 34 of Capote (which are each proposed to be the compressible film in the Office Action) are not actually compressible. Instead, both the encapsulant 150 and the flux adhesive 34 are described as being substances that “harden” when heated. Accordingly, because neither Xu nor Capote teach or suggest a film that surrounds sides of connectors, wherein the film is compressible when heated, then the proposed combination of Xu and Capote fails to teach the claimed feature of a compressible film that has sufficient compressibility to accommodate up to a 3% volume expansion of the connectors when the connectors are melted.

The Office Action argues that the encapsulant of Xu’s structure could comprise rubber “since rubber is defined as materials that have elastic properties similar to that of natural rubber” (Office Action, p.3, para. 8 – p. 4, para. 1); however, the Office Action fails reference any support in the prior art for this assertion. Additionally, the Office Action argues that the encapsulant comprises epoxy (Office Action, p. 4, para. 1 (citing Xu, col. 4, lines 59-61)). Nevertheless, nothing within Xu, including the portions cited by the Office Action, mentions that the encapsulant could comprise rubber.

Instead, Xu only discloses that the encapsulant “comprises a formulation of a resin having epoxy and flexibilisers” and “may be made of any of a variety of electrically insulative inorganic materials including glass, silicon dioxide or aluminum” (Xu, col. 4, line 59 – col. 5, line 15). However, Xu does not clearly describe or otherwise define the term “epoxy”. Merriam-Webster’s Online Dictionary defines epoxy as “containing a 3-membered ring consisting of one oxygen and two carbon atoms”. Nevertheless, nothing

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within Xu expressly or implicitly teaches or suggests that the encapsulant could comprise rubber. Further, Applicants note that word searches for the terms "rubber", "elast", "compress", and "foam" resulted in zero (0) results.

Accordingly, it is Applicants' position that Xu fails to teach or suggest that the encapsulant could comprise rubber or foam. Instead, Xu merely discloses that the encapsulant could include resin having epoxy and flexibilisers, and any of a variety of electrically insulative inorganic materials including glass, silicon dioxide or aluminum. Therefore, Applicants respectfully submit that Xu does not teach or suggest the claimed feature of "a compressible film comprising one of a rubber and a foam" as defined by independent claim 29.

The Office Action admits that Capote does not discuss lead-free solders and instead the Office Action argues that the use of lead-free solders would have been obvious. However, this reasoning ignores that one of the goals of the claimed invention was to overcome some of the thermal expansion problems associated with solders that expand, such as lead-free solders. Furthermore, Applicants respectfully submit that nothing within Xu mentions the presence or absence of lead within the electronic devices. If fact, a word search for the term "lead" resulted in zero (0) relevant results. Because neither Xu nor Capote disclose lead-free solders, there is no motivation provided to one ordinarily skilled in the art to utilize the claimed compressible film in order to compensate for the thermal expansion associated with lead-free solders. Therefore, it would not have been obvious to modify Xu and Capote in the manner suggests in the Office Action.

Further, as shown above, neither Xu nor Capote teaches or suggests the claimed compressible film that "remains compressible through more than one thermal excursion" as defined by independent claim 8 and therefore Xu and Capote do not render obvious independent claim 8. Further, dependent claims 11-14 are similarly not obvious, not only because they depend from a patentable independent claim, but also because of the additional features of invention they define. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Therefore, it is Applicants' position that the proposed combination of Xu and Capote does not teach or suggest many features defined by independent claims 1, 8, and

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29 and that such claims are patentable over the prior art of record. Further, it is Applicants' position that dependent claims 4-7, 11-14, and 30-37 are similarly patentable, not only because of their dependency from a patentable independent claims, but also because of the additional features of the invention they defined. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

II. Formal Matters and Conclusion


With respect to the rejections to the claims, the claims have been amended, above, to overcome these rejections. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections to the claims.

In view of the foregoing, Applicants submit that claims 1, 4-8, 11-14, and 29-37, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0458.

Respectfully submitted,

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Duane N. Moore
Registration No. 53,352

Gibb I.P. Law Firm, LLC
2568-A Riva Road, Suite 304
Annapolis, MD 21401
Voice: (410) 573-6501
Fax: (301) 261-8825
Customer Number: 29154